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(54) Title of the Device: Optical Disk, and Rotation Control Device for Drive Motor

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SPECIFICATION

1. Title of the Device: Optical Disk, and Rotation Control Device for Drive Motor

2. Claims

(1) An optical disk, wherein markers for detecting rotational speed are formed equidistantly spaced and in a concentric circular shape around the outer peripheral edge of an optical disk.

(2) A rotation control device for an optical disk drive motor, wherein a photodetector is disposed along the movement path of markers on an optical disk[1] supported rotatably around a center hole by the rotary shaft of a drive motor, and the rotational speed of the drive motor is controlled on the basis of the number of passes of markers per unit of time as detected by the photodetector.

3. Detailed Description of the Device

Field of Industrial Utilization

The present device relates to an optical disk and to a rotation control device for a drive motor.

Prior Art

In recent years optical disks that are compact in size but still allow a large amount of information to be recorded have become the standard medium for recording various kinds of data or audio-visual (AV) signals, and considerable development has gone into optical information recording and reproducing devices with which the information recorded on an optical disk can be reproduced by optical pickup, and with which the user can write information as desired.

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[1] Translator's note: "The above-mentioned markers on the above-mentioned optical disk" in the original, but this claim is not a dependent claim, and therefore reference to Claim 1 is in error.

A great deal of sophisticated technology is used in the optical disk drive devices used in these optical information recording and reproducing devices, but an element that is particularly important in the recording and reproducing of data to and from an optical disk is the technology employed to control the disk rotational speed.

Ways of controlling an optical disk include a method in which the angular velocity (rotations) is kept constant, and a method (CLV) in which the linear velocity is varied according to the inner and outer radial positions of a pickup.

For example, with a method in which linear velocity is controlled, the linear velocity is set to about 1.25 m/s, and this linear velocity is constant, so if the rotational speed of a CD when the pickup is located at the innermost edge of the optical disk is about 600 rpm, for example, the speed is set to about 200 rpm when the pickup is located at the outermost edge.

With a method in which the linear velocity is kept constant, the velocity information used to keep the linear velocity constant is pre-stored at a specific part of the disk, and reading only becomes possible when the rotational speed is raised to at least a specific level, so the linear velocity is uniformly switched and controlled on the basis of the velocity information that has been read after the rotational speed has been raised to at least a specific level.

The conventional way to carry out this operation has been to insert a frequency generator in the control circuit of the disk motor, and perform control by utilizing the output of this frequency generator.

A rotational speed control circuit with an inserted frequency generator such as this is used in the above-mentioned method for keeping angular velocity constant, but regardless of the method, improvement has been needed because the use of a frequency generator leads to a more complicated circuit.

Object of the Device

The present device was conceived in light of the above situation, and it is an object thereof to provide an optical disk and a rotation control device with which angular velocity can be kept constant without having to use a frequency generator that adds complexity to the circuit configuration.

Configuration of the Device

To achieve the stated object, the present device is characterized in that markers for detecting rotational speed are formed equidistantly spaced and in a concentric circular shape around the outer peripheral edge of an optical disk.

The present device is also characterized in that a photodetector is disposed along the movement path of markers on an optical disk[1] supported rotatably around a center hole by the rotary shaft of a drive motor, and the rotational speed of the drive motor is controlled on the basis of the number of passes of markers per unit of time as detected by the photodetector.

The present device will now be described in detail on the basis of a preferred working example depicted in the appended drawings.

FIGS. 1a, 1b, and 1c are a plan view, an A-A cross section, and a B-B cross section illustrating an example of the optical disk used in the present device. Markers 2 for detecting rotational speed are formed equidistantly spaced and in a concentric circular shape in the circumferential direction around the outer peripheral edge of an optical disk 1. These markers 2 can be grooves that reflect detection light from a detection means (discussed below), through-holes that allow the passage of detection light, a reflective film for changing the reflectivity, or the like.

FIG. 2 is a schematic diagram of the circuit configuration of an apparatus for keeping the rotational speed of the optical disk constant. This apparatus comprises an optical pickup 6 supported movably in the arrow direction under the optical disk 1, which is supported around a center hole by the output shaft of a disk motor 5, a photodetector 7 disposed at a location along the movement path of the markers 2, an amplifier 8 that amplifies the detection signal from the photodetector 7, and a comparator 9 into which are inputted a reference signal and the signal from the amplifier and which controls the rotational speed of the motor 5 so that these two signals match.

A reflection-type sensor is used as the photodetector 7. The reflection light from the light emitting element that makes up this sensor is reflected by the markers and received by a light receiving element, or is transmitted and the presence of reflected light is detected.

Specifically, the rotational speed of the optical disk 1 is detected by the photodetector 7 as the number of passes of the markers 2 per unit of time (proportional to the rotational speed), and this detection signal is inputted to the comparator 9 as a pulse signal. The pulse signal inputted to the comparator 9 is compared with a reference pulse signal. This reference pulse signal is information used to keep the angular velocity of the optical disk constant, and the motor 5 is controlled so that this reference signal matches the input signal.

A waveform formation circuit may be inserted instead of an amplifier.

The above circuit configuration is just one example. For instance, [the motor] may be controlled on the basis of an analog voltage value obtained by integration of pulses per unit of time.

Furthermore, data related to rotational speed may be inputted to a microcomputer or other such control means, and the motor may be controlled on the basis of this data.

When the disk is manufactured by compression molding, protrusions corresponding to the above-mentioned markers may be added to the stamper, and when the manufacture is by vapor deposition, a mask may be worked so as to correspond to the markers, with no risk of driving up the cost.

Effect of the Device

As discussed above, with the present device, markers for controlling rotation are provided on the optical disk side, and a detection means for reading these markers is provided on the drive device side, so rotational speed can be detected without providing a frequency generator that would otherwise make the circuit configuration more complicated and increase the cost. Therefore, the rotational speed detection mechanism of the present device can also be utilized for rotational speed detection required as a preliminary stage to detecting linear velocity.

4. Brief Description of the Drawings

FIGS. 1a, 1b, and 1c are a plan view, an A-A cross section, and a B-B cross section illustrating an example of the optical disk used in the present device; and

FIG. 2 is a schematic diagram of the circuit configuration of an apparatus for keeping the rotational speed of the optical disk constant.

1 ... optical disk

2 ... marker

6 ... optical pickup

7 ... photodetector

8 ... amplifier

9 ... comparator

Applicant: Ricoh Co., Ltd.

FIG. 1

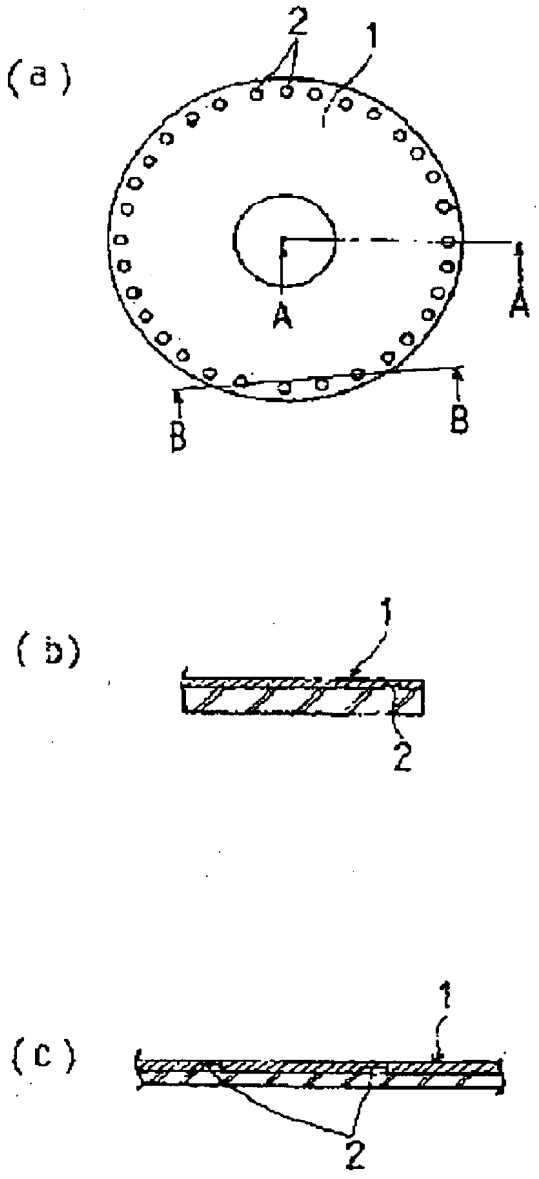

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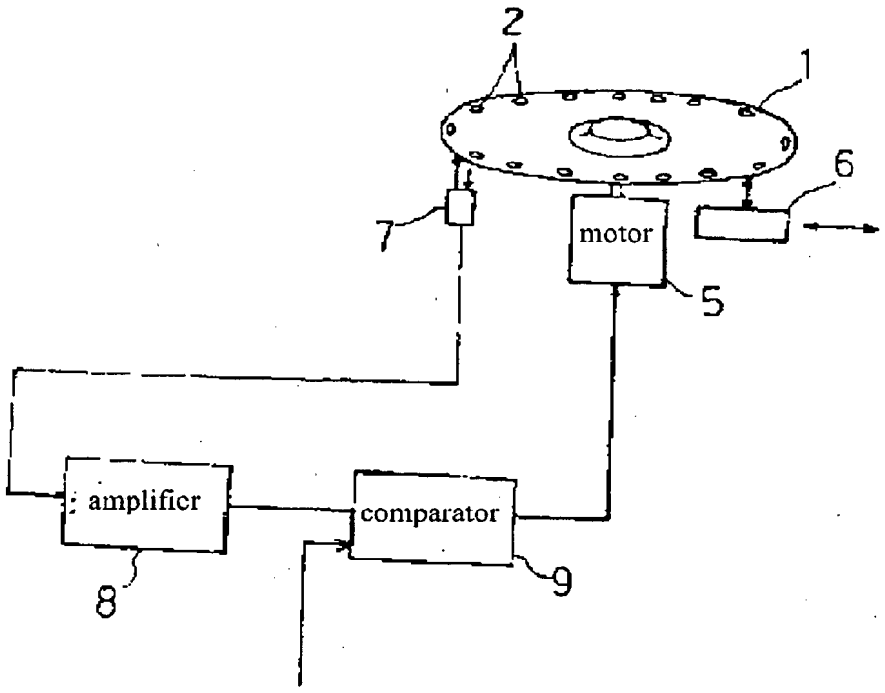
FIG. 2



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